

Name: _____

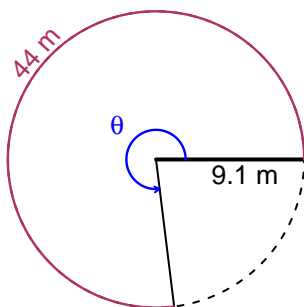
Date: _____

Trig Final (Solution v37)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 9.1 meters. The arc length is 44 meters. What is the angle measure in radians?

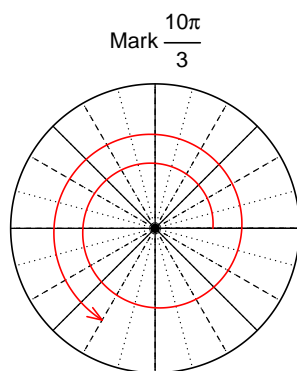


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$\theta = 4.835$ radians.

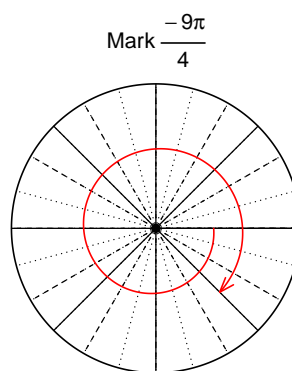
Question 2

Consider angles $\frac{10\pi}{3}$ and $-\frac{9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{10\pi}{3}\right)$ and $\sin\left(-\frac{9\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(10\pi/3)$

$$\cos(10\pi/3) = -\frac{1}{2}$$



Find $\sin(-9\pi/4)$

$$\sin(-9\pi/4) = -\frac{\sqrt{2}}{2}$$

Question 3

If $\cos(\theta) = \frac{-9}{41}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



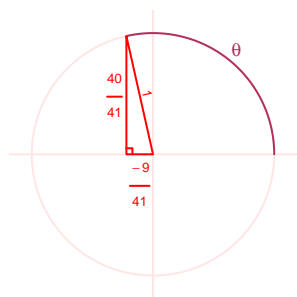
Solve the Pythagorean Equation

$$9^2 + B^2 = 41^2$$

$$B = \sqrt{41^2 - 9^2}$$

$$B = 40$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{40}{41}}{\frac{-9}{41}} = \frac{-40}{9}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -7.28$ meters, a frequency of 3.07 Hz, and an amplitude of 4.16 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 4.16 \sin(2\pi 3.07t) - 7.28$$

or

$$y = 4.16 \sin(6.14\pi t) - 7.28$$

or

$$y = 4.16 \sin(19.29t) - 7.28$$